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Magnetic-Field-Induced Collapse of Charge-Ordered Nanoclusters and the Colossal Magnetoresistance Effect in Nd(0.7)Sr(0.3)MnO(3)

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We report s-ray scattering studies of charge-orbitally ordered (COO) nanoclusters in $Nd_{0.7}Sr_{0.3}MnO_3$. We find that the Coo nanoclusters are strongly suppressed in an applied magnetic field, and that their decreasing concentration follows the field-induced decrease of the sample electrical resistivity. The COO nanoclusters, however, do not completely disappear in the conducting state, suggesting that this state is inhomogeneous and contains an admixture of an insulating phase. Similar results were also obtained for the zero-field insulator-metal transition that occurs as temperature is reduced. These observations suggest that these correlated lattice distortions play a key role in the colossal magnetoresistance effect in this prototypical manganite.